

Substrate-Controlled Chemical Reaction -Role of Lewis Acid-



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The development of asymmetric catalysts is the most sophisticated art in the chemical sciences. It can be read like a novel when the critical scientific contributions are presented in a chronological manner. Initially, most of the basic organic transformations depend on mechanism-controlled pathways. The transition state for each transformation is strictly controlled by the structural or electronic mechanism of the reactions. Thus, the selectivity of these reactions is crucially regulated by the structural motif of the transition states. On the other hand, there are several transformations that depend on substrate-controlled approach. Sharpless epoxidation of allylic alcohols is a nice example. In this case, the epoxidation proceeds only next to the hydroxyl group and without this directing group olefinic oxidation does not proceed at all. Thus, the reaction is regioselective and stereoselective. In addition, if a chiral ligand is used on a metal center, an enantioselective process is accomplished. The third trend is a regioselective and enantioselective process flexibly controlled by the ligand design. During my lecture, I will discuss the importance of Lewis acid catalyst for this new wave of molecular science.